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First scientific observation of the threatened speartooth shark *Glyphis glyphis* (Müller & Henle, 1839) (Carcharhiniformes: Carcharhinidae) in Indonesia

by

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Résumé. – Première observation scientifique du requin à dents de scie menacé *Glyphis glyphis* (Müller & Henle, 1839) (Carcharhiniformes : Carcharhinidae) en Indonésie.

Le requin lancette *Glyphis glyphis* se rencontre en Australie et Papouasie-Nouvelle-Guinée, et il n'avait jamais été signalé au-delà de cette aire d'extension. Le présent article fournit le premier signalement de cette espèce en-dehors de sa distribution connue. Nous avons identifié un spécimen de *G. glyphis* en 2018, à la rivière Digul dans le district de Mappi, Province de Papouasie, Indonésie. Cette découverte représente le premier signalement pour cette espèce en Indonésie, représentant une extension d'environ 250 km vers l'ouest de la distribution connue. Ce nouveau signalement est basé sur des photographies, l'information fournie par les pêcheurs locaux, des observations personnelles et les dossiers de l'expédition.

Key words. – Distribution extension – Indo-West Pacific – Papua Province – River sharks – Threatened species.

Carcharhinidae (requiem sharks) is one of the most diverse shark families, being widely distributed in tropical, subtropical, and temperate waters worldwide (Weigmann, 2016). Although most species inhabit continental, coastal and offshore marine waters, the family includes some euryhaline species (Compagno *et al*., 2005; Ebert *et al*., 2013), with some inhabiting freshwaters (Compagno and Cook, 1995; Last, 2002). Freshwater carcharhinids of the genus *Glyphis* Agassiz, 1843 are known as 'river sharks', as proposed by Compagno (1984), due to their occurrence in tropical rivers and associated deltas in the Indo-West Pacific region. Currently this genus comprises three valid species: *Glyphis gangeticus* (Müller & Henle, 1839), *Glyphis garricki* Compagno, White & Last, 2008, and *Glyphis glyphis* (Müller & Henle, 1839) (Fricke *et al*., 2021). All 'river shark' species are listed under a threatened category on the International Union for the Conservation of Nature's Red List of Threatened Species (here after 'IUCN Red List'), due to their occurrence in restricted habitats and their declining population status likely resulting from habitat specificity and threat posed by overfishing (Compagno *et al*., 2009; Grant *et al*., 2019; Kyne *et al*., 2021a).

With an IUCN Red List current status of Vulnerable (VU), the speartooth shark *Glyphis glyphis* is one of the few truly euryhaline requiem sharks, occurring in marine, estuarine, and freshwater environments (Compagno *et al*., 2009; Kyne *et al*., 2021a). Like other river sharks (*e.g*. *G. gangeticus* and *G. garricki*) the amount of information available on several aspects, such as ecology, genetics, and distribution, for *G. glyphis* has increased over the past decades (Feutry *et al*., 2014; Dwyer *et al*., 2020). On the other hand, the limits and extent of its geographic distribution in the Western Indo-Pacific region are still unclear (Campagno *et al*., 2002, 2009; Pember *et al*., 2020; Kyne *et al*., 2021a). *Glyphis glyphis* is a top aquatic predator, currently known only from Northern Australia and Southern Papua New Guinea (PNG) (White *et al*., 2015, 2017; Fricke *et al*., 2021; Kyne *et al*., 2021a). However, there are no records for this species in Indonesia in many national and global taxonomic guides (*e.g*. Campagno and Niem, 1998; Last *et al*., 2010; Ebert *et al*., 2013; White *et al*., 2017; Kyne *et al*., 2021a). In this paper, we report the first record of *G. glyphis* in the Digul River, Papua Province, Indonesia, corresponding to a distribution extension of about 250 km to the west.

MATERIAL AND METHODS

On June 3, 2018, one specimen of *G. glyphis* was collected by local fishermen in the Digul River, Mappi District, Papua Province, Indonesia. This specimen was photographed (*Glyphis glyphis* can be easily identified through photographs) and some data was taken. After that, the specimen was released. The photographs and data obtained were sent to the first author of this work. All the results of the present work are based on these photographs and data obtained in the field, and information from the literature.

RESULTS

The specimen we found in 2018 confirms the Digul River as a new locality for *G. glyphis* in Papua Province, Indonesia; the updated distribution range for this species is shown in figure 1. The main diagnostic features that allowed us to identify the specimen as *G. glyphis* were: (1) the boundary between light and dark areas (waterline) on the head passing just below the eye; (2) the darker dorsal region and lighter ventral region; and (3) second dorsal fin about three-quarters of the height of the first dorsal fin (Figs 2, 3); as described in Compagno *et al*. (2008) and White *et al*. (2017). These features easily differentiate *G. glyphis* from *G. garricki*, a sympatric congener also present in the south of New Guinea (see Fricke *et al*., 2021).

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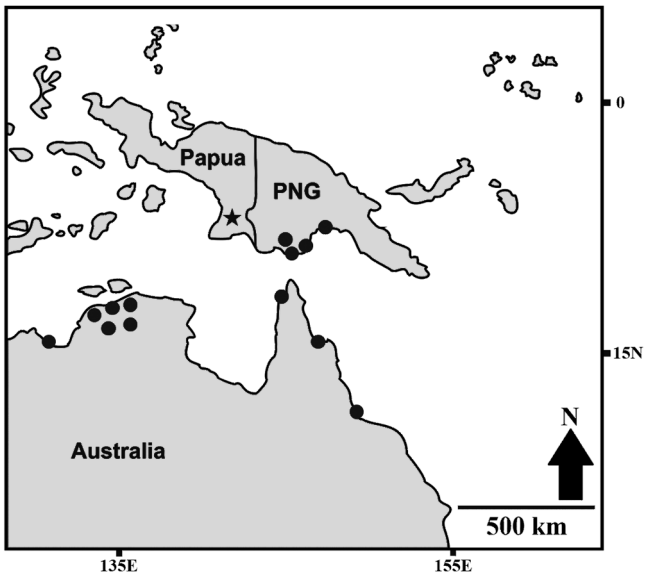

Figure 1. – Distribution records of *Glyphis glyphis*, based on previous studies (circles) and this study (star).

Figure 2. – *Glyphis glyphis* specimen caught by local fisherman on June 3, 2018 in Digul River, Mappi District, Papua Province, Indonesia (photograph by Arhy Janggo).

Figure 3. – Head coloration pattern of *G. glyphis* specimen showing the boundary between light and dark areas (waterline) on head passing just below the eye (photograph by Arhy Janggo).

DISCUSSION

Although two species of *Glyphis*, *G. glyphis* and *G. garricki*, occur sympathetically in Northern Australia and PNG (Fricke *et al*., 2021), they are easily and unequivocally differentiated by the aforementioned characters, especially due to *G. garricki* has the second dorsal fin with about half of the height of the first dorsal fin (*vs* about three-quarters height of the first dorsal fin in *G. glyphis*) and the waterline passing well below level of eye (*vs* passing just below eye in *G. glyphis*) (see White *et al*., 2017). The known distribution of *G. glyphis* is restricted to Northern Australia and Southern Papua New Guinea (White *et al*., 2015, 2017; Fricke *et al*., 2021; Kyne *et al*., 2021a), possessing a worldwide decreasing population estimated at 2,500-10,000 mature individuals (Kyne *et al*., 2021a). The speartooth shark (*G. glyphis*) is currently considered as a Vulnerable (VU) species on a global scale by the IUCN Red List (Kyne *et al*., 2021a). It occurs specifically in large tidal rivers, estuaries, and coastal regions. This kind of habitat specificity increases its susceptibility to the impacts caused by human activities, particularly fishing and habitat degradation and modification. In addition, we cannot ignore the suspected low reproduction rates of this species, as well as illegal fishing that also impacts its populations (Grant *et al*., 2019; Kyne *et al*., 2021a). Confirmed reports on the occurrence of *G. glyphis* in Kimberley region of Western Australia (Kyne *et al*., 2021b) and Northern Australia are confined to eight river basins, with most being in Van Diemen Gulf drainages (Feutry *et al*., 2014). *Glyphis glyphis* is known to occur in Northern Australia from the Bizant and Wenlock Rivers (east and west coasts of Cape York, Queensland) to the East Alligator, South Alligator and Adelaide Rivers (Compagno *et al*., 2008). Records of *G. glyphis* in rivers and estuaries in PNG were listed by Compagno *et al*. (2010), who examined material collected in marine, brackish and freshwater environments, including the Fly River and Port Romilly (PNG). White *et al*. (2015) reported the collection of three adult specimens of *G. glyphis* (one pregnant female and two males, 2370-2600 mm TL) at Katatai (Daru region, PNG), in coastal marine waters adjacent to the mouth of the Fly River.

This work represents the first record of *G. glyphis* for Indonesia, more precisely for the Papua Province (see Allen and Boeseman, 1982; Allen, 1991; Fricke *et al*., 2021; Kyne *et al*., 2021a), and information on its current distribution and abundance in the Indo-West Pacific region are scarce, probably because the species is rare and rarely sampled. Among other biological topics, providing new registers of rare non-marine elasmobranchs is an important contribution to improve the understanding of species diversity and biogeography in the Indo-West Pacific (Hasan and Islam, 2020; Hasan and Widodo, 2020). This first scientific observation of *G. glyphis* in this new locality improves the scientific knowledge on this species by extending its distribution range to the Indo-West Pacific region further west (by about 250 km), corresponding to a new country: Indonesia, in Papua Province (Fig. 1). Furthermore, this first registration of this vulnerable and rare species for Indonesia will allow appropriate conservation policies to be adopted by the government.

Directions for future research include additional data collection assisted by local fisherman, in order to access the occurrence of *G. glyphis* (and even other freshwater-tolerating elasmobranchs), and evaluation of the importance of Papua Province in Indonesia as a habitat for river sharks. As other euryhaline elasmobranchs such as sawfish, freshwater whipray, and bull shark, *G. glyphis* is not the main commodity of fisheries due to its low abundance (White *et al*., 2017). There are no official data on how many individuals of *G. glyphis* are caught, since it is not a target species for commercial fisheries. Although *G. glyphis* are not normally targeted, they are commonly captured as bycatch in commercial and recreational fisheries in Australia (Compagno *et al*., 2009; Field *et al*., 2013; White *et al*., 2015; Kyne *et al*., 2021a). In Australia, the retention of *G. glyphis* is prohibited. However, in Papua New Guinea it is not, and it is retained for its meat and fins by small-scale fishers (Kyne *et al*., 2021a). As next-step actions for the Indonesian government through the Ministry of Marine Affairs and Fisheries, we suggest

the prohibition on retaining and fishing threatened sharks, using official regulations, especially for rare species with low reproduction rates, such as *G. glyphis*, following the prohibition on retaining this species like in Australia. This protection regulation may control the fishing activities, allowing a sustainable existence of this species in their habitats.

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